In order to understand Great Salt Lake we must first go back in time to the Tertiary Period.

1. Early Tertiary

Need to go back to early Tertiary ~ 50mya
1. Tropical environments as far north as Canadian border
2. North America void of mountains, climate uniform
3. Ocean beaches north as far as San Antonio area

2. Late Tertiary
   Oligocene (38mya) climate started becoming cooler.
   Miocene – Rockies begin uplift, major vegetational changes.

3. Pleistocene effects in North America
   Climate change started in Oligocene continued and resulted in many (7-10) glacial advances in North America
During the Pleistocene, a wetter climate in the West caused large lakes to fill some of the interior basins.

Each glacial advance followed by interglacial.
Its uncertain when Lake Bonneville first began to form but evidence suggests that the Bonneville basin has been a region of internal drainage for much of the past 15 million years.

At its largest extent Lake Bonneville was nearly 325 miles long, 135 miles wide and over 1000 ft deep.

In northern Utah the growth of Lake Bonneville served to make the climate there more moist, and to provoke "lake effect" snows, which focused precipitation in the Wasatch and Uinta Mountains.

Lake effect snows occur when a mass of sufficiently cold air moves over the warmer water of GSL, creating an unstable temperature profile in the atmosphere. Eventually clouds develop into snow showers and squalls as they move downwind.
The intensity of lake effect is increased when higher elevations downwind of the lake force the cold, snow-producing air to rise even further.

The "lake effect" expanded the impact of the glaciers, and ultimately provided a positive feedback for growth of Lake Bonneville.

During the interglacial periods between 25,000 to 30,000 years ago the lake was smaller than it would become during the late stages of the last major ice age when Lake Bonneville would become one of the largest lakes in North America.

The rise of Lake Bonneville started about 28,000 years ago and continued until 22,000 years ago when a slight drop and 2000 year stabilization created the Stansbury shoreline.
<table>
<thead>
<tr>
<th>Name</th>
<th>Elevation</th>
<th>Age (years before present)</th>
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</thead>
<tbody>
<tr>
<td>Gilbert</td>
<td>4,275</td>
<td>12,800-11,600</td>
</tr>
<tr>
<td>Provo</td>
<td>4,840</td>
<td>16,800-16,200</td>
</tr>
<tr>
<td>Bonneville</td>
<td>5,220</td>
<td>18,000-16,800</td>
</tr>
<tr>
<td>Stansbury</td>
<td>4,445</td>
<td>24,400-23,200</td>
</tr>
</tbody>
</table>

33,000 years ago
lake about the size and shape of Great Salt Lake

28,000 years ago
lake on the rise in response to climate change (from hot dry "global interglacial" to wet cold "global glacial")
26,000 – 22,000 years ago
Stansbury level... (4,445 ft) it’s a big lake and hangs out at this level more than once. This is the level of the floor of Cache Valley.

20,000 and 16,000 years ago
Lake rose and stabilized for ~ 1,500 years, creating the Bonneville shoreline. This lake level was controlled by a topographic divide near Zenda, Idaho, where the water flowed out of the basin and into the Snake River drainage.

Fish lived in Lake Bonneville; amphibians, waterfowl, and other birds inhabited its marshes; and animals such as buffalo, horses, bears, rodents, deer, camels, bighorn sheep, musk oxen, and mammoths roamed its shores.

16,000 – 14,500 years ago
Bonneville level (5,220 ft). The lake drops about 32 ft (100 m) from the Bonneville level to the Provo level by a catastrophic flood.
14,500 years ago

Breach occurred at Red Rock Pass and flooded much of southern Idaho.

The Lake Bonneville flood filled the Pocatello Valley and flowed up through Marsh Valley and then out onto the Snake River Plain. The flood emptied the top 107 meters of water from Lake Bonneville, an estimated volume of 4,750 cubic km of water.

The peak discharge from the Red Rock Pass outlet is estimated to have lasted for about 8 weeks and to have been about 500 times that of the maximum discharge ever recorded from the Snake River at Idaho Falls.

The outlet consisted of unconsolidated mud, sand and boulders. This unstable dam failed and released a massive flood that lowered the lake level 375 ft. in less than a year.

The peak flow was equivalent to the average flow of all the world’s modern rivers combined!
14,500 – 13,000
Provo Level (4,840 ft)

12,000 years ago
LOW LEVEL. The lake drops from the Provo level to even below the present level of Great Salt Lake by climate change (from cold wet of "global glacial" to warm dry of "global interglacial")

12,000 – 10,000 years ago
rise to Gilbert (4,275 ft)

10,000 years ago to present
Great Salt Lake

The arrival of humans has been set by archaeologists at about 10,000 years ago.